



## Complete Summary

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### GUIDELINE TITLE

National pesticide practice skills guidelines for medical & nursing practice.

### BIBLIOGRAPHIC SOURCE(S)

National Environmental Education & Training Foundation (NEETF). National pesticide practice skills guidelines for medical & nursing practice. Washington (DC): National Environmental Education & Training Foundation (NEETF); 2003 Jan. 76 p. [15 references]

## COMPLETE SUMMARY CONTENT

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INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT  
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## SCOPE

### DISEASE/CONDITION(S)

Pesticide exposure and/or poisoning

### GUIDELINE CATEGORY

Management  
Prevention  
Treatment

### CLINICAL SPECIALTY

Emergency Medicine  
Family Practice  
Internal Medicine  
Obstetrics and Gynecology  
Pediatrics  
Preventive Medicine

## INTENDED USERS

Advanced Practice Nurses  
Health Care Providers  
Nurses  
Physician Assistants  
Physicians  
Public Health Departments

## GUIDELINE OBJECTIVE(S)

To outline knowledge and skills that health care professionals need to have about pesticides

## TARGET POPULATION

Individuals with demonstrated or potential exposure to pesticides

## INTERVENTIONS AND PRACTICES CONSIDERED

### Prevention

1. Environmental History
  - Focused medical history including questions regarding occupational/nonoccupational exposure factors
2. Awareness of community and individual pesticide risk factors
  - Use of community assessment data to recognize potential sources of exposure
  - High risk occupations include:
    - Farming, agriculture, migrant work, structural application
    - Groundskeeping, schools, gardening (pesticide application): structural, agriculture, greenhouse, nurseries, golf courses, freeways, forestry, residential, schools
    - Extermination services
  - Develop community resources that might be consulted in event of a pesticide-related incident

### Treatment/Management

1. Recognize the signs and symptoms of pesticide exposures (both acute and chronic)
  - Cross-reference lists of pesticides and classifications
  - Rapid reference lists and tables
2. Diagnose pesticide-related illness using appropriate testing procedures and environmental history.
3. Treat and manage health conditions associated with pesticide exposure.
  - Basic management techniques include eye, skin, and gastrointestinal decontamination, airway protection, and control of seizures.
4. Refer patients to appropriate specialists and resources.
5. Follow up appropriately with preventive guidance and clinical evaluation.

6. Report incidence of exposure as required according to federal and state agencies
7. Provide prevention education to patients and the community

#### MAJOR OUTCOMES CONSIDERED

- Number of reported pesticide poisonings
- Mortality associated with pesticide poisoning
- Treatment outcomes (e.g., symptom relief, referrals to specialist)

### METHODOLOGY

#### METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Primary Sources)  
Hand-searches of Published Literature (Secondary Sources)  
Searches of Electronic Databases

#### DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

The developer used the National Library of Medicine electronic search engines, including Medline; conference proceedings; and books owned by the authors or accessed through colleagues. In addition, the guideline developers also examined the reference lists of papers and reports gathered, and were aware of previous or new government and professional association reports. All other evidence was obtained from expert committee reports or opinions and/or the clinical experience of the guideline authors and reviewers.

#### NUMBER OF SOURCE DOCUMENTS

Not stated

#### METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Not stated

#### RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not applicable

#### METHODS USED TO ANALYZE THE EVIDENCE

Review

#### DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

#### METHODS USED TO FORMULATE THE RECOMMENDATIONS

Not stated

## RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

## COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

## METHOD OF GUIDELINE VALIDATION

Peer Review

## DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

This document has been reviewed in draft form by individuals chosen for their unique perspectives and technical expertise. The purpose of this independent review was to elicit candid and critical comments that would assist in making this published document as sound and effective as possible.

## RECOMMENDATIONS

### MAJOR RECOMMENDATIONS

#### Practice Skill I: Taking an Environmental History

I-1. Understand the purposes and general principles for taking an environmental history.

- Purposes include:
  - Increase awareness of environmental/occupational factors.
  - Improve diagnosis.
  - Prevent disease and aggravation of conditions.
  - Identify potential work-related environmental hazards, and/or environmental hazards in and around the home and community.
  - Detect new associations.
  - Improve rapport with patient.
- Know the differences in exposure effects on different groups (e.g., children, adults, pregnant and lactating women, elderly).
- Recognize sign/symptoms for pesticides under consideration (see Practice Skill IV below).
- Understand relationships of suspect exposures to health outcomes, including "hallmark" indicators of exposure.
- Recognize timing of suspected exposure to manifested signs and symptoms, including what makes signs/symptoms disappear or get worse.

I-2. Incorporate general environmental screening questions into routine patient histories.

- Adults:
  - What kind of work do you do?
  - Do you notice the problems you are having while you are at work? at home? in your community? in a specific location?
  - What causes symptoms to come and go?
  - Have you recently used pesticides, solvents, insecticides, weed killers?
  - What kinds of hobbies do you have?
  - Has your workplace been treated recently for insects, weeds, or other pest problems?
- Children: (Questions asked of parent or guardian)
  - Where does your child go to school, daycare, playgrounds?
  - Have any of these places been treated recently (e.g., sprayed) for insects, weeds, or other pest problems?
  - Does your child help with gardening activities?
  - Sources of food, water (e.g., well water), breast feeding of infant.

I-3. Be able to take a complete environmental exposure/health history for adults and children, covering occupational and nonoccupational exposure factors.

- Adults:
  - Type of work, including how long on the job, kinds of work exposures, any specific pesticide or work exposure (e.g., agricultural, extermination), sorting of contaminated clothing, use of personal protective equipment (PPE), hygiene practices of applicators, coworker symptoms.
  - Home environment (age of home, characteristics of heating and ventilation system), use of pesticides in gardening or as an insecticide in the home, well water or source of drinking water, storage of chemicals, type of food bought/eaten, anyone else in family sick, hobbies (e.g., pottery, photography, painting, furniture stripping).
  - Community exposures, including home location near industry, businesses (e.g., auto repair shops, dry cleaners), landfills, hazardous substance spills.
- Children: (Questions asked of parent or guardian)
  - Where child goes to school, daycare, playground, play
  - Whether child helps with gardening activities
  - Hobbies
  - Sources of food, water (e.g., well water), breast feeding of infant
  - Parent's occupational exposure
  - Developmental issues
  - If parents have occupational exposure, is the clothing worn during application stored and washed separately from family clothing?

I-4. Develop network of resources.

- Know local and state experts or specialists who can be consulted for differential questions or exposure questions.
- Review pesticide label, or obtain information on pesticide labels related to health hazards and adverse effects.

- Contact patient's employer about potential work-related pesticide exposures and access to material safety data sheets, for information on health hazards and adverse effects.
- Develop network of resources for assessment tools.
- Compile Web resources for Material Safety Data Sheets (MSDS) and label information.

## Practice Skill II: Awareness of Community and Individual Pesticide Risk Factors

II-1. Possess basic awareness of environmental aspects of communities in which patients live.

- Recognize differences in geographic dispersion of population in urban and rural living patterns and relationship to possible pesticide exposure. Recognize that different populations and communities have different exposures to pesticides.
- Use available community assessment data to begin an evaluation of the community (e.g., windshield surveys, citizen surveys, observation, newspaper, Environmental Protection Agency (EPA) Web site zip code search, public library). Consider:
  - Location of homes near major industrial complexes or freeways
  - Air and water quality
  - Demographics of community members
  - What populations are at greatest risk (elderly, children, workers, pregnant and lactating women, other)?
  - Are there any cultural issues that may be predisposing to certain exposures?
  - Where do children play?
  - What community resources are available?
  - Where are high risk locales (farms, landfills, urban crowding)?
  - Which seasonal industries pose the greatest risk of exposure?
  - Are some population groups highly mobile or transient?
  - What are common problems related to pest infestation (rodents, mosquitoes, ants, cockroaches)?
- Recognize potential environmental sources of exposure:
  - Recreational areas and fields
  - Yards
  - Golf courses
  - Schools and daycare facilities

II-2. Recognize high-risk occupations for pesticide exposure.

The likelihood of pesticide poisoning depends in part on whether or not an individual is present in environments where pesticide exposure is likely to occur, such as:

- Farming, agriculture, migrant work, structural application
- Groundskeeping, schools, gardening (pesticide application): structural, agriculture, greenhouse, nurseries, golf courses, freeways, forestry, residential, schools
- Extermination services

Table 1 in the original guideline document lists numerous occupations that increase the chance for pesticide exposure, as well as some nonoccupational sources that present an opportunity for pesticide exposure.

### II-3. Develop community resource list.

The resource listing shown in Table 2 in the original guideline document summarizes in one place the various people and organizations that might be consulted in the event of a pesticide-related incident. They include:

- Basic hospital/emergency care
- Poison control/toxicology assistance
- Health care professional specialists
- University/public agency supports
- Resources specific to locale

## Practice Skill III: Knowledge of Key Health Principles

III-1. Demonstrate key principles of environmental/occupational health, epidemiology, and population-based health.

- Understand determinants of persons, location, and time related to exposures:
  - Humans differ markedly in their responses dependent on genetics, metabolism, age, gender, size, coexposure, behavior factors, routes of exposure (dermal, inhalation, ingestion).
  - Location of exposure includes workplace, home, community, and recreational sites.
  - Understand sources of exposure, routes of exposure, clusters of cases.
  - Know the relationship of time, duration, and frequency of exposure to health outcomes, change in symptoms during the workday, week, weekends, vacation, etc.
  - Recognize that the effects of environmental exposures vary with a number of factors, including rate, type, concentration, and frequency of exposure.
- Be aware of sentinel health events that are unusual patterns of illnesses occurring in persons or community groups that can also act as a "red flag" for wider environmental health problems, such as pesticide poisoning.
- Recognize that many environmental diseases are related to a number of causes interacting together:
  - Understand the type and nature of exposure.
  - Acquire information about possible interactions including tobacco and alcohol.
  - Consider other health conditions that could be aggravated, such as asthma.
- Know exposure hazards (biological, chemical, enviromechanical, physical, psychosocial):
  - Biological/infectious hazards are caused by infectious/biological agents, such as bacteria, viruses, fungi, or parasites that may be transmitted via contact with infected patients or contaminated body secretions/fluids, contamination of drinking water supplies (improper sewage treatment and solid waste disposal), and through the air (enhanced by improperly cleaned heating and cooling systems).

- Chemical hazards are various forms of chemicals that are potentially toxic or irritating to the body system, including medications, solutions, and gases. They include pesticides, (herbicides, fungicides, insecticides, etc.) and other household and industrial chemicals. Insecticides and herbicides used in large scale agriculture as well as in households, yards, and gardens, bring about numerous health effects ranging from nausea to long term neurological problems. Not only are many insecticides and herbicides acutely toxic, but some are highly suspect carcinogens.
- Enviromechanical hazards are factors encountered in the work environment that cause or potentiate accidents, injuries, strain, or discomfort (e.g., poor equipment or lifting devices, slippery floors).
- Physical hazards are agents within the work environment, such as radiation, electricity, extreme temperatures, and noise that can cause tissue trauma.
- Psychosocial hazards are factors and situations encountered or associated with one's job or work environment and personal life experiences that create or potentiate stress, emotional stress, and/or interpersonal problems.
- Consider the impact of hazardous substances on reproductive events (preconception, fetal), lactation, and developmental milestones in children (newborn, infant/toddler, and school age).
- Recognize that others may be ill (work, family) and get timeline of health problems for these or consult public health authorities for help in evaluating exposures.

### III-2. Understand the dose-response relationship.

- Assess recent and past exposures to toxic agents.
- Review interpretation of exposure monitoring data done by a professional (e.g., industrial hygienist).
- Recognize that in a dose-response relationship, as the dose increases, the severity of effect increases and could be fatal with pesticides.
- Understand that high dose exposures may manifest signs and symptoms almost immediately, making causal relationships more easily identified.
- Understand that low dose exposures over a period of time may manifest effects over a long latency period, often months or years (e.g., cancer, chemical sensitivity, neuropathy).

### III-3. Understand measures of morbidity/mortality and study designs.

- Know incidence rates (i.e., number of new cases of illness/injury in the at-risk population during a defined period) and prevalence rates (i.e., all cases of illness/injury in the population at a point in time) of exposure and morbidity related to the home and community.
- Know the different types of study designs that can be utilized in investigations.
- Support or conduct investigations:
  - Differentiate study designs (case-control, cohort, cross-sectional studies) and when each is appropriate to use.
  - Understand ethical issues in using experimental designs or clinical trials in research.



- Participate in study efforts as able.
- Be alert to possible clustering of pesticide exposure cases through case identification, examination of dose-response relationships, and population disease rate increases.
- Use epidemiologic data to link exposure and effect.
- Initiate opportunities for investigation of disease outbreaks through collaboration with public health, academic, governmental bodies (Centers for Disease Control and Prevention [CDC], EPA, etc.).

### Practice Skill IV: Clinical Management of Pesticide Exposure

IV-1. Recognize the signs and symptoms of pesticide exposures (both acute and chronic).

#### Basic Clinical Management Techniques

Basic management of acute pesticide poisoning includes eye, skin, and gastrointestinal decontamination, airway protection, and control of seizures. These techniques apply to most pesticide poisonings although there are special concerns for specific pesticides. Basic techniques are outlined below.

#### Skin and Eye Decontamination

- Shower patient, hair to toe with soap and water to remove chemical.
- Rubber gloves should be worn during decontamination.
- Remember to clean skin folds and under fingernails.
- Flush eyes with lots of clean water for 10 to 15 minutes.
- Contaminated clothing should be removed promptly and bagged.
- Avoid contact with contaminated clothing and body fluids.

#### Airway Protection

- Ensure clear airway.
- Suction oral secretions.
- Administer oxygen unless not recommended (i.e., in paraquat and diquat poisoning).

#### Gastrointestinal Decontamination

No technique should be considered as routine management in pesticide poisonings, but can be considered as an option.

- Gastric Lavage:
  - Use only with ingestion of potentially life-threatening amount of poison and if it can be done within 60 minutes of ingestion.
  - Contraindicated in hydrocarbon ingestion
- Catharsis:
  - Should be used as a single dose to reduce harmful effects
  - Sorbitol – 1–2 g/kg one time dose or
    - Adults: 70% sorbitol, 1–2 mL/kg
    - Children: 35% sorbitol, 1.5–2.3 mL/kg

- Contraindications include absent bowel sounds, abdominal trauma or surgery, and intestinal perforation or obstruction. Also contraindicated in volume depletion, hypotension, electrolyte imbalance, and ingestion of a corrosive substance
- Sorbitol is not recommended for poisoning with organophosphate, carbamates, arsenical diquat, or paraquat.
- Activated Charcoal:
  - Most effective if used within 60 minutes of ingestion
  - Dosage:
    - Adults 12 years and older: 25–100 g in 300–800 mL of water
    - Children under 12 years: 25–50 g
    - Infants under 20 kg: 1g/kg
  - Contraindications include unprotected airway, non-intact gastrointestinal tract, if there is increased risk for aspiration of a hydrocarbon pesticide
- Syrup of Ipecac:
  - Check pesticide label to determine if induced vomiting is contraindicated.
  - Dosage:
    - Adolescents and adults: 15–30 mL followed immediately with 240 mL of water
    - Children 1–12 years: 15 mL preceded or followed by 120–240 mL of water
    - Infants 6 months to 12 months: 5–10 mL preceded or followed by 120–240 mL of water
  - Dose may be repeated if no emesis in 20 to 30 minutes.
  - Contraindications include diminished airway protective reflexes, ingestion of a corrosive material, ingestion of a substance likely to lead to life support within the next hour.

### Control of Seizures

- Most patients respond to benzodiazepines.
- Lorazepam for status epilepticus:
  - Adults: 2–4 mg/dose given intravenously (IV) over 2–5 minutes. Repeat as necessary to 8 mg in 12 hours
  - Adolescents: Same as adult with 4 mg maximum
  - Children under 12 years: 0.05–0.10 mg/kg IV over 2–5 minutes. Repeat as necessary 0.05 mg/kg 10–15 minutes after first dose. Maximum of 4 mg
- Diazepam is often used for organochlorine poisonings.
  - Adults: 5–10 mg IV, repeat every 5–10 minutes to maximum of 30 mg
  - Children: 0.2–0.5 mg/kg IV every 5 minutes to maximum of 10 mg in children over 5 years and 5 mg in children under 5 years
- Phenobarbital may also be used.
  - Adults, children, and infants: 15–20 mg/kg IV loading. 5 mg/kg IV every 15–30 minutes for a maximum of 30 mg/kg. Do not push drug faster than 1 mg/kg per minute.

IV-2. Diagnose pesticide-related illness using appropriate testing procedures and treat pesticide exposures.

Symptoms of pesticide poisoning and acute and long-term effects of exposure are outlined in Table 5 in the original guideline document. This type of information should be at the finger-tips of practitioners. The material is organized by pesticide classification (insecticides, herbicides, fungicides, rodenticides, disinfectants, and miscellaneous).

Table 4 in the original guideline document can be used as a cross reference to determine the classification of common pesticides.

IV-3. Treat and manage health conditions associated with pesticide exposure or refer patients to appropriate specialists and resources, and follow up appropriately.

#### Carcinogenic and Reproductive Effects

The likelihood of pesticide exposure causing cancer is dependent on the frequency, duration, and magnitude or intensity of exposure as well as on latency (the length of time from exposure to onset of disease). The potential for carcinogenicity shown in Table 6 in the original guideline document is based on EPA's classification system.

#### Adverse Reproductive Outcomes

Table 7 in the original guideline document outlines reproductive outcomes for certain pesticides for which there are either animal or human data. The information in this table is suggestive only and should not be considered conclusive.

#### IV-4. Rapid Reference Tables for Common Pesticides

Tables 8-14 in the original guideline document can be used as rapid reference tables for signs and symptoms of common exposures, as well as evaluation tips and key points of treatment. Practitioners can identify common pesticides that may explain a patient's symptoms or physical findings and then identify basic evaluation and treatment recommendations. The following points should be kept in mind in using these tables:

- Included are those pesticides most often involved in symptomatic illness, based on 1996 data from the American Association of Poison Control Centers' Toxic Exposure Surveillance System.
- The symptoms and signs listed are not specific to pesticide poisoning, but can be manifestations of other illness or exposures.
- An individual exposed to a pesticide listed in the tables may present with signs and symptoms not listed in the tables.
- The main purpose of this reference is to provide the practitioner with hints that may indicate additional investigation or prompt referral for further evaluation and treatment.

For further information, refer to EPA's Recognition and Management of Pesticide Poisonings for more in-depth discussion of toxicology, poisoning confirmation, and treatment for these and other pesticides.

## Practice Skill V: Reporting Pesticide Exposure and Supporting Surveillance Efforts

V-1. Understand the importance of surveillance and incident reporting.

- Identify illnesses and hazards that are potentially related to pesticide exposure.
- Review available data that allow for trend analysis of pesticide exposures and health effects.
- Monitor a given population for disease occurrence.
- Identify hypersensitive individuals to develop strategies to prevent disease in others.
- Remove individuals from exposure as indicated.
- Provide information to individuals, groups, and committees about efforts (e.g., reporting and tracking exposures) to further the understanding of pesticide-related advanced health outcomes.
- Be able to access and report data for local, regional, and national surveillance programs.

V-2. Know the roles of federal and state regulatory agencies with regard to pesticide exposure control.

- The Environmental Protection Agency (EPA) is the lead federal agency for regulation of pesticide use under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). FIFRA requires training and certification of pesticide applicators which is enforced through delegated authority to the states. Health care providers can obtain pesticide information and surveillance data from state agencies and EPA.
- The Federal Food, Drug, and Cosmetic Act (FFDCA) is the basic food and drug law in the U.S. and is administered by the Food and Drug Agency (FDA). It establishes the concept of a tolerance (the maximum legally permissible level of residue at harvest) for pesticide residues in or on human food and animal feed. Tolerances are specific to a pesticide/commodity combination. FFDCA requires EPA to establish these residue tolerances for pesticides in or on food, feed, and byproducts.
- Under the Food Quality Protection Act (FQPA) of 1996, EPA is to review all tolerances for existing pesticides within ten years to determine that they meet the new health-based standard – i.e., that they pose a "reasonable certainty of no harm" from aggregate and cumulative exposures. (Aggregate exposure refers to exposures from all sources, including residues in food and drinking water, occupational exposures, and incidental exposures. Cumulative exposure refers to exposure to different pesticides that share a common mechanism of action.) FQPA also provides extra protection for infants and children, by requiring an explicit determination that tolerances are safe for children, including an additional safety factor of up to 10-fold, if necessary, to account for uncertainty in data relative to children; and requiring consideration of children's special sensitivity and potential exposure to pesticides.
- Other federal agencies also have important roles in pesticide exposure control, and offer resources for health care providers.
  - The Occupational Safety and Health Administration (OSHA) has authority over work-related exposures (e.g., pesticide manufacturing).

OSHA can perform inspections to determine if a hazard is present. Anonymous calls can be made to prompt an investigation.

[www.osha.gov](http://www.osha.gov)

- The National Institute for Occupational Safety and Health (NIOSH) conducts research, funds professional occupational safety and health education, and conducts health hazard evaluations. Providers can obtain educational materials and surveillance data from NIOSH related to occupational safety and health. [www.cdc.gov/niosh/homepage.html](http://www.cdc.gov/niosh/homepage.html)
- The Centers for Disease Control and Prevention (CDC) offer epidemiological data and guidance, surveillance, health statistics reports, and laboratory information. [www.cdc.gov](http://www.cdc.gov)
- The Agency for Toxic Substances and Disease Registry (ATSDR) develops case studies in environmental medicine and risk profiles for individual pesticides. [www.atsdr.cdc.gov](http://www.atsdr.cdc.gov)
- EPA's Worker Protection Standard (WPS) is the regulation that applies to agricultural pesticide handlers and field workers. It includes requirements for: warnings about pesticide applications, use of personal protection equipment, restrictions on reentry into treated areas, decontamination, emergency medical assistance, and pesticide safety training.
- State departments of agriculture, health or environment will investigate pesticide exposure incidents. State specific requirements for reporting to Workers' Compensation may vary.

#### V-3. Report pesticide exposures as required.

- Know the mandatory reporting requirements in the state in which the provider is practicing (over 25 states have mandatory reporting requirements).
- Report pesticide-related illness to the appropriate authorities, such as local and state health departments.
- Be aware of workers' potential reluctance to get involved in reporting of workplace exposures, due to fears of retaliatory action and economic loss. Consent of the patient should be obtained prior to reporting.
- Report and validate Workers' Compensation claims as indicated in each state.

### Practice Skill VI: Providing Prevention Guidance and Education to Patients

#### VI-1. Engage in primary prevention strategies to promote health and prevent disease among patients.

For Individuals and Families:

- Assess perceived risk of exposure. Provide anticipatory guidance about pesticides to prevent exposures. (For example, advise families on appropriate concentrations of N, N-diethyl-m-toluamide [DEET].)
- Provide anticipatory guidance about signs, symptoms, and recognition of pesticide exposure; and safe use of pesticides including hygiene practices, and protective clothing (pamphlets, slides, etc.). Advise patients to read and follow label directions on protective garb needed when applying pesticides around the home, garden, or yard. Long pants, a long-sleeved shirt, and chemical-resistant gloves are generally recommended as extra protection even when not required by the label.

- Teach patients to read labels and follow instructions carefully, paying specific attention to precautionary statements and "signal words" that indicate level of toxicity.
- Assess lifestyle factors and medications taken for interactions. Discuss or refer to specialist about use of substitutes.
- Deal appropriately with pesticide-related questions that patients pose – whether by asking additional pertinent questions, by searching out accurate information, by referring patients to specialists, or by preparing oneself to answer certain types of questions (see Examples of frequently asked questions [FAQs]).
- Counsel patients about minimizing unnecessary use of pesticides. Discuss the rationale for integrated pest management. Advise family to contact local county cooperative extension services for information regarding alternatives to pesticide use for control of insects, weeds, etc.
- Discuss potential reproductive toxicity (e.g., teratogenic) effects related to pesticide exposures.
- Caution nursing mothers that pesticides may be excreted into mother's milk.
- Be aware that there may be specific patient populations with limitations in reading labels (illiterate, non-English speaking only, etc.), and special preventive education may be necessary.

#### For Workers:

- Assess occupational exposure risk knowledge.
- Provide anticipatory guidance about pesticides to prevent exposures.
- Educate about signs/symptoms of pesticide exposure.
- Discuss and demonstrate use of personal protective equipment and clothing, (gloves, face shields, aprons, boots). Teach patients to read labels and follow instructions carefully. Discuss the dangers of altering mixing and application procedures. Teach patients to pay attention to specific components of a pesticide label, including precautionary statements and "signal words" that indicate level of toxicity.
- Teach patients to be prepared to treat emergencies prior to occurrence, to know what types of first aid are indicated and contraindicated, and to ensure that necessary equipment, supplies, etc., are available and in proper working order.
- Assess lifestyle factors and medications taken for interactions. Discuss or refer to specialist about use of substitutes.
- Discuss use of closed cab systems in mixing and loading pesticides with proper training, closed tractor cabs in application. Carbon-high efficiency particulate air (HEPA) filtration systems are recommended in some cases.
- Discuss use of substitute pesticide formulations that are less toxic.
- Discuss need for washing facilities for decontamination and removal of residues before eating or bathroom use.
- Discuss avoidance of mixing/spraying during windy conditions.
- Discuss need to change contaminated clothing at work, place in a separate bag, and wash separately from other wash.
- Be aware that there may be specific patient populations with limitations in reading labels (illiterate, non-English speaking only, etc.), and special preventive education may be necessary.

VI-2. Work proactively with patients and the community to prevent exposure, ensure early detection, and limit effects of illness.

Individuals/Families:

- Provide information about emergency procedures to be used if contamination occurs.
- Discuss how to report exposures to appropriate authorities.
- Conduct screening tests to detect pesticide-related exposure/illness (e.g., cholinesterase, spirometry), including baseline screening and after exposure.
- Limit disability and rehabilitate or restore to optimal functioning, for example, by providing avenues for vocational rehabilitation, or case management services to restore optimal functioning.

Workers:

- Conduct worker screening tests (e.g., cholinesterase, spirometry) to detect pesticide-related exposure/illness. If possible, conduct baseline screening before and after exposure. Remove worker from exposure if indicated.
- Advise workers to carry water attached to tractors and know emergency procedures for decontamination (need to follow WPS and OSHA regulations about providing basic hygiene requirements).
- Partner with workers to develop peer support groups for disabled workers.

Population-Based:

- Work with local agricultural extension office, agro-universities, local grain/pesticide sellers, health care practitioners, farm bureaus, garden shops, plant nurseries, manufacturers, distributors, etc. in prevention strategy development.
- Develop network for new work opportunities.
- Work with community groups (e.g., schools, parent-teacher associations, churches, daycare, migrant groups, farm worker, farm associations) to identify environmental justice issues, and to discuss and advocate for targeted prevention strategies.
- Discuss need for integrated pest management programs to control pest growth.
- Develop/use pesticide/illness incident reporting system to track patterns of exposure and disease.

CLINICAL ALGORITHM(S)

None provided

## EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is not specifically stated for each recommendation.

## BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

### POTENTIAL BENEFITS

- Improved understanding of the health effects associated with pesticide exposures as well as broader environmental exposures.
- Appropriate action to ameliorate the effects of pesticide exposures through clinical and prevention activities.

### POTENTIAL HARMS

None stated

## CONTRAINDICATIONS

### CONTRAINDICATIONS

- Gastric lavage: Contraindicated in hydrocarbon ingestion
- Catharsis: Contraindications include absent bowel sounds, abdominal trauma or surgery, and intestinal perforation or obstruction. Also contraindicated in volume depletion, hypotension, electrolyte imbalance, and ingestion of a corrosive substance
- Sorbitol is not recommended for poisoning with organophosphate, carbamates, arsenical diquat, or paraquat
- Activated charcoal: Contraindications include unprotected airway, non-intact gastrointestinal tract, if there is increased risk for aspiration of a hydrocarbon pesticide
- Syrup of ipecac: Contraindications include diminished airway protective reflexes, ingestion of a corrosive material, ingestion of a substance likely to lead to life support within the next hour.
- Organophosphates: Contraindications: morphine, succinylcholine, theophylline, phenothiazines, reserpine
- Carbamates: Contraindications: morphine, succinylcholine, theophylline, phenothiazines, reserpine
- Organochlorines: Contraindications: atropine, epinephrine, other adrenergic amines due to enhanced myocardial irritability, animal or vegetable oils or fats by mouth
- Cationic detergents: Gastrointestinal decontamination is contraindicated

## QUALIFYING STATEMENTS

### QUALIFYING STATEMENTS

- The conclusions and opinions expressed herein are those of the authors and do not necessarily represent the views and policies of the U.S. Environmental Protection Agency (EPA).
- The literature review conducted for this effort yielded a small selection of articles that point to the relatively limited knowledge of pesticides and pesticide-related illnesses on the part of primary health care practitioners.



The studies conducted suffer somewhat from limited sampling strategies and response rates.

## IMPLEMENTATION OF THE GUIDELINE

### DESCRIPTION OF IMPLEMENTATION STRATEGY

#### Incorporating Pesticides into Practice Skills

The task of incorporating pesticide information into practice skills for primary care providers will require multiple collaborations over a period of years. Examples of the types of recommended efforts to be undertaken under the National Strategies for Health Care Providers: Pesticides Initiative include the following:

- Collaborations with established professional societies in planning and co-sponsoring continuing education activities.
  - Mini-symposia
  - Dedicated continuing education modules and monographs for publication
- Collaborations with regulatory/non-regulatory agencies in planning and co-sponsoring traditional and distance education continuing education activities. For example:
  - Agency for Toxic Substances and Disease Registry. (ATSDR) – Teleconference
  - National Occupational Research Agenda (NORA)
  - Environmental Protection Agency (EPA)
  - National Institute of Environmental Health Sciences (NIEHS)
- Working with universities, colleges, hospitals, health care agencies, non-profit organizations, and Area Health Education Centers to plan, develop, and co-sponsor targeted continuing education.

#### Points of Contact for Training/Refreshing Practitioners

Following are possible venues and points of contact for providing training or refresher courses, experts for lectures or consultations, as well as a flow of information to practitioners on pesticide-related and environmental health issues.

- Agriculture Health and Safety Centers
- Area Health Education Centers (AHEC)
- Case studies
- Certification and recertification exams
- Continuing education (CE) modules
- Conferences
- Continuing education monographs
- Cooperative Extension Service Pesticide Safety Education Coordinators
- Distance Learning (Internet)
- Hotlines
- Libraries (universities, Internet, professional associations)
- In-service education
- Journals
- Medscape, other Internet websites

- Newsletters
- NIOSH Environmental Resource Centers
- Pediatric Environmental Health Specialty Units
- Professional association meetings/conferences (national, state, local)
- Regulatory agency websites and links
- Video demonstrations

## Adult Education Principles

In designing and presenting training sessions or refresher courses on pesticides in clinical practice, it is useful to bear in mind the following ideas and principles culled from adult education research.

1. Several factors influence the adult learner:
  - Self-perception of knowledge
  - Preconceived attitudes
  - Experience
  - Level of confidence
2. Health care providers may have already acquired knowledge, formed opinions, and adopted attitudes toward the topic of pesticides and about environmental health in practice.
3. A number of aspects of environmental health may affect the willingness of practitioners to learn about pesticides, and incorporate issues about pesticide exposure into routine clinical practice:
  - Environmental health problems of any kind can be very complex and time-consuming.
  - Reimbursement for services may not be available.
  - The possibility of interacting with the legal system may act as a deterrent to becoming involved in environmental health problems.
  - Practitioners may have other sociopolitical and cultural perceptions that may lead to resistance to learning in environmental health, for example: "It's not a problem in my patient population," "I don't agree with environmental activists," "My patients have other more pressing concerns," or "I can't learn all I need to about environmental toxicology."
4. Learners should be encouraged to openly express their perceptions about environmental health issues and the practitioner's role.
5. Individuals must be motivated to learn, so it is important to demonstrate the immediate practical value of addressing pesticide exposure in clinical practice.
6. Assumptions about the significance of pesticides should be challenged (e.g., "Pesticide exposure is not relevant for my patients.").
7. Instructors can affect the learner's self-concept as practitioners by finding out what the learner already knows. The instructor can explore whether or not the learner feels his or her responsibility extends only to treatment or to investigation and prevention of pesticide exposures as well.
8. A short survey can be used to disclose knowledge and attitudes about pesticides and environmental health in general. This information can be used to discuss barriers and issues.
9. There are several key ways in which adults learn:
  - By solving problems
  - By seeing, listening, and doing
  - By remembering the first and last information presented

- Through association and repetition
10. Varying the teaching methods used helps in maintaining the adult learner's interest:
- a. Case studies
    - Should be short
    - Should be as real as possible
    - Can be oral or written
    - Develop a few specific questions for discussion
  - b. Group discussions
    - May be used to explore issues about investigation and advocacy
    - Present a case. Example: In the past 4 months you and your colleagues have seen 4 children (ages 9 and 10) complaining of cough, shortness of breath and chest tightness and eye, nose and throat irritation. From an environmental history, you learn that all children attend the same school. The mother of one of the children is concerned that her child is being exposed to something at school.
    - Develop discussion questions. Examples:
      - What is the role and responsibility of the health care practitioner to pursue the mother's suspicions?
      - What actions should be taken?
      - What actions are required to be taken?
      - How could risks be communicated to parents or others who are concerned?
      - What should be documented in charts?
      - What plan of action is most appropriate for the health care provider?
  - c. Instructor/student demonstrations
    - Skill building
    - Should demonstrate incorrect as well as correct techniques
  - d. Structured practice/role play
    - Opportunity to practice communication skills with help of partner
  - e. Lectures
    - Aim is to establish a baseline of knowledge.
    - Communication is generally one-way, so other methods should be used to facilitate the learner's problem-solving skills.
    - Enhance effectiveness of lecture by:
      - Including personal examples, stories, perspectives
      - Limiting the lecture to 45-60 minutes
      - Outlining learning objectives at the beginning and summarizing what was learned at the end
      - Avoiding reading from prepared notes
    - Use audiovisual aids.
    - Distribute handouts summarizing key points.
    - Hold a large group discussion after lecture.
11. Give credit for participation.
- Incentives
  - Recognition
12. Establish some method of evaluation. Evaluation approaches may include:
- Pre- and post-tests for knowledge evaluation
  - Checklists for practice observation to document skills application, such as patient assessment, through direct or indirect (video) observation

- Chart audits for knowledge and skill demonstration
- Evaluation of specific learning objectives
- Community based organizations/groups in evaluation

## INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

### IOM CARE NEED

Getting Better  
Staying Healthy

### IOM DOMAIN

Effectiveness  
Patient-centeredness

## IDENTIFYING INFORMATION AND AVAILABILITY

### BIBLIOGRAPHIC SOURCE(S)

National Environmental Education & Training Foundation (NEETF). National pesticide practice skills guidelines for medical & nursing practice. Washington (DC): National Environmental Education & Training Foundation (NEETF); 2003 Jan. 76 p. [15 references]

### ADAPTATION

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### GUIDELINE COMMITTEE

Not stated

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#### FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

#### GUIDELINE STATUS

This is the current release of the guideline.

#### GUIDELINE AVAILABILITY

Electronic copies: Available in Portable Document Format (PDF) from the [National Environmental Education and Training Foundation Web site](#).

Print copies: Available from The National Environmental Education & Training Foundation, 1707 H Street, NW, Suite 900, Washington, DC 20006-3915.

#### AVAILABILITY OF COMPANION DOCUMENTS

The following is available:

- National Environmental Education & Training Foundation (NEETF). National pesticide competency guidelines for medical & nursing education. Washington (DC): National Environmental Education & Training Foundation (NEETF); 2003 Jan. 55 p.

Electronic copies: Available in Portable Document Format (PDF) from the [National Environmental Education and Training Foundation Web site](#).

Print copies: Available from The National Environmental Education & Training Foundation, 1707 H Street, NW, Suite 900, Washington, DC 20006-3915.

## PATIENT RESOURCES

None available

## NGC STATUS

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